Geolocating data

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Contents

This is from the fifth chapter of learn.r-journalism.com.

Geolocating addresses in R

We're going to start with geolocating municipal police stations in Connecticut.

We'll be using the ggmap package for a lot of functions, starting with geolocating addresses with Google Maps.

```
# if you don't have the following packages installed, uncomment and run the lines below

#install.packages(c("dplyr", "ggplot2", "tidyr", "ggmap", "DT", "knitr", "readr"))

library(readr)
library(dplyr)
library(ggplot2)
library(tidyr)
library(ggmap)
library(DT)
library(knitr)
```

```
stations <- read_csv("data/Police_Departments.csv")
```

```
## Parsed with column specification:
## cols(
##   NAME = col_character(),
##   DESCRIPTION = col_character(),
##   TELEPHONE = col_character(),
##   ADDRESS = col_character(),
##   ADDRESS2 = col_character(),
##   CITY = col_character(),
##   STATE = col_character(),
##   ZIP = col_integer(),
##   ZIPP4 = col_integer()
## )
```

```
glimpse(stations)
```

```
## Observations: 185
## Variables: 9
## $ NAME        <chr> "AMTRAK POLICE DEPARTMENT", "ANDOVER POLICE DEPART...
## $ DESCRIPTION <chr> "OTHER", "MUNICIPAL", "COLLEGE OR UNIVERSITY", "CO...
## $ TELEPHONE   <chr> "203-773-6000", "860-742-0235", "860-405-9088", "8...
## $ ADDRESS     <chr> "50 UNION AVENUE", "17 SCHOOL ROAD", "1084 SHENNEC...
## $ ADDRESS2    <chr> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA...
## $ CITY        <chr> "NEW HAVEN", "ANDOVER", "GROTON", "HARTFORD", "NEW...
## $ STATE       <chr> "CT", "CT", "CT", "CT", "CT", "CT", "CT", "CT", "C...
```

```
## $ ZIP          <int> 6519, 6232, 6340, 6103, 6050, 6410, 6413, 6415, 61...
## $ ZIPP4        <int> 1754, 1526, 6048, 1207, 2439, 2249, 2115, 1230, 16...
```

To find the latitude and longitude of an address, we need a full address like you would put into Google Maps. This data frame has a separate column for each piece of the address.

We need a single column for addresses, so we'll concatenate *ADDRESS*, *CITY*, *STATE*, and *ZIP*.

{{% notice important %}} Did you notice the zip code is numeric and has only 4 digits out of 5 for zip code? That's because Connecticut zipcodes all start with 0. We'll need to put that 0 back for the geocoding to work successfully. {{% /notice %}}

```
stations <- stations %>%
  mutate(ZIP=paste0("0", as.character(ZIP))) %>%
  mutate(location = paste0(ADDRESS, ", ", CITY, ", CT ", ZIP))
```

The function to geocode a single address is `geocode()` but we've got a bunch of addresses, so we can use `mutate_geocode()`.

```
geo <- mutate_geocode(stations, location)
```

```
# If it's taking too long, you can cancel and load the output by uncommenting the line below
geo <- read_csv("data/geo_stations.csv")

# Bringing over the longitude and latitude data
stations$lon <- geo$lon
stations$lat <- geo$lat
```

This is using Google's service, and last I checked there were about 2,500 queries allowed per day if you don't have a key. If you do get a key, check out the documentation at the bottom of this page.

Also did you know that Google let's you reverse geocode?

If you pass latitude and longitude data to `revgeocode()` it will return an address.

```
revgeocode(c(lon = -77.030137, lat = 38.902986))
```

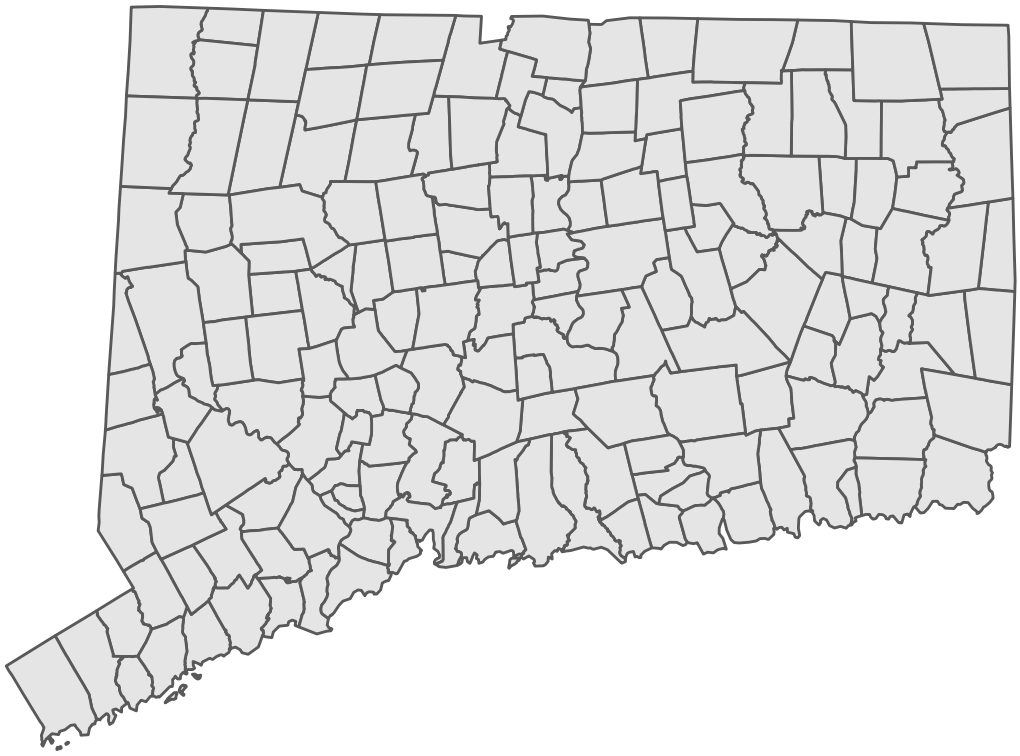
```
## [1] "One Franklin Square, 1301 K St NW, Washington, DC 20071, USA"
```

Plotting points with ggplot2

Let's pull town shapes for Connecticut with **tigris**.

```
# If you don't have tigris or ggplot2 or sf installed yet, uncomment and run the line below
#install.packages("tigris", "sf", "ggplot2")

library(tigris)
library(sf)
library(ggplot2)

# set sf option

options(tigris_class = "sf")

ct <- county_subdivisions("CT", cb=T)

# If cb is set to TRUE, download a generalized (1:500k) counties file.
```

```
# Defaults to FALSE (the most detailed TIGER file).

ggplot(ct) +
  geom_sf() +
  theme_void() +
  theme(panel.grid.major = element_line(colour = 'transparent')) +
  labs(title="Connecticut towns")
```

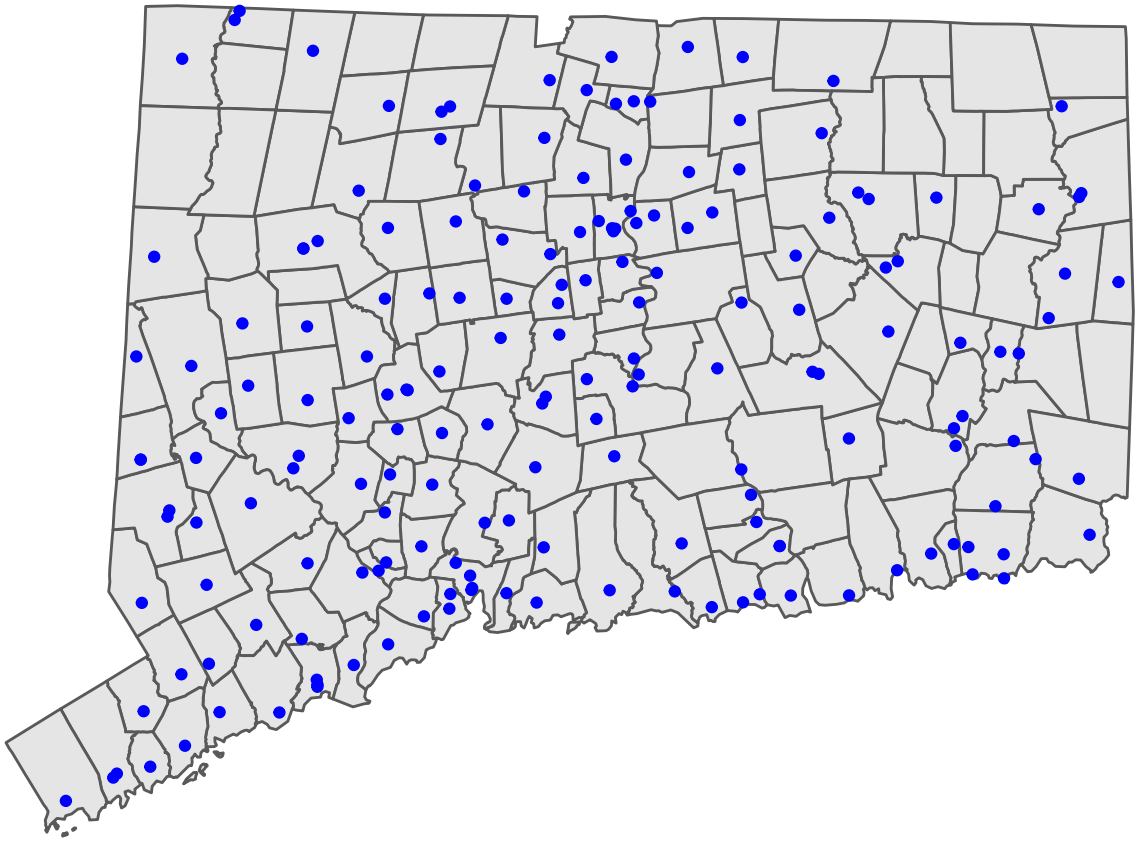


Okay, we've got the shapefile.

We just add the geolocated points like it was dots on a chart. Because that's essentially what latitude and longitude is.

```
ggplot(ct) +
  geom_sf() +
  geom_point(data=stations, aes(x=lon, y=lat), color="blue") +
  theme_void() +
  theme(panel.grid.major = element_line(colour = 'transparent')) +
  labs(title="Police stations")
```

Police stations

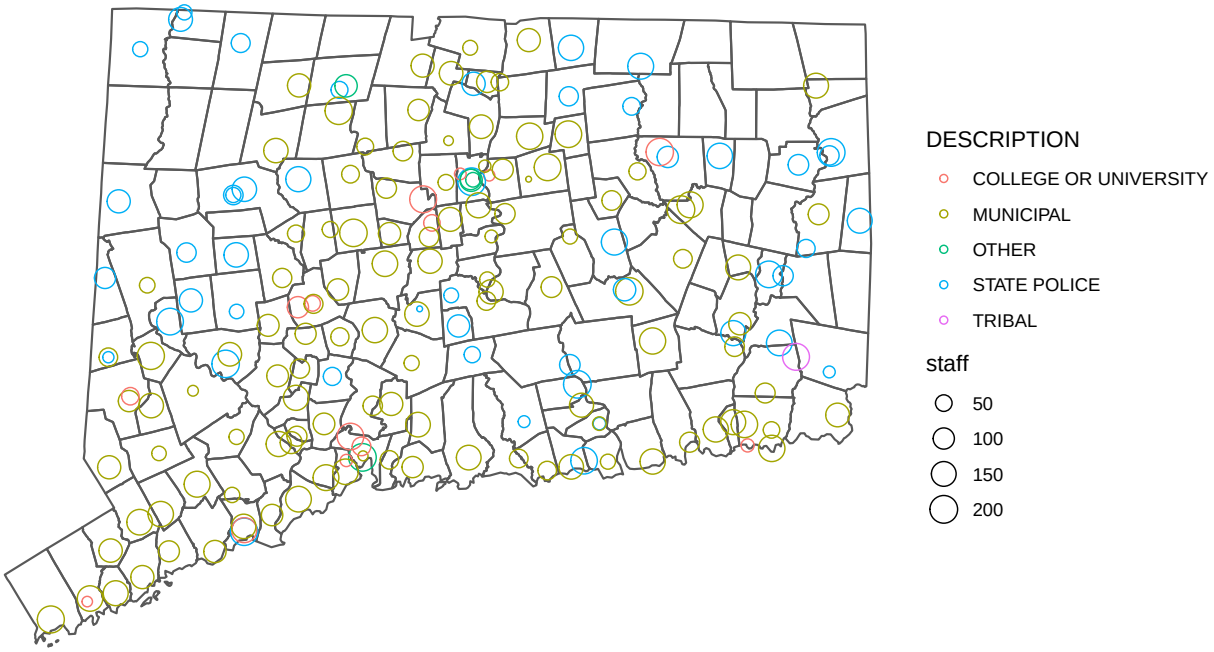


Alright, I'll throw in grouping for Description.

And generate some random numbers for staffing for each station so we can make some circle plots.

```
set.seed(7)

stations$staff <- sample(200, size=nrow(stations), replace=T)

ggplot(ct) +
  geom_sf(fill="transparent") +
  geom_point(data=stations, aes(x=lon, y=lat, size=staff, color=DESCRIPTION),
             fill="white", shape=1) +
  theme_void() +
  theme(panel.grid.major = element_line(colour = 'transparent')) +
  labs(title="Police stations in Connecticut") +
  coord_sf()
```

Police stations in Connecticut



I also threw in `coord_sf()` in there at the end. It makes sures that all layer are using a common *CRS*. It sets it based on the first layer.

You can set other projections easily.